

### 3.4 vocab

Parameter - a # that describes a pop.  
fixed #  
Unknown (usually)

Ex: avg. ht. of H.S. Seniors ( $\mu$ )  
prop. or prob. of heads in coin flip

Statistic -

- a # that describes a sample
- changes from sample to sample

Ex: sample of 50 H.S. Seniors  $\bar{x} = 65"$

Coin flip x 10 prop. of heads = 60% =  $\hat{p}$

# Sampling Variability

change  
different

- value of a statistic varies in repeated samplings

Ex: coin flip  $\times 10$

# Heads:	6	7
	3	3
	2	4
	5	0
	0	0

Simulation - use random digits to represent events

- then randomly generate those digits as our sample
- doing an expt. w/o actually doing it

Ex: coin flip

H = 0  $\rightarrow$  1-10

T = 1  $\rightarrow$  11-20

randInt(0, 1)

randInt(1, 20)

Ex: dice roll

#1-6

randInt(1, 6)

Ex: baseball player  
batting avg: 0.345  
 $n = 100$

Hit: 1-345

Miss: 346-1000

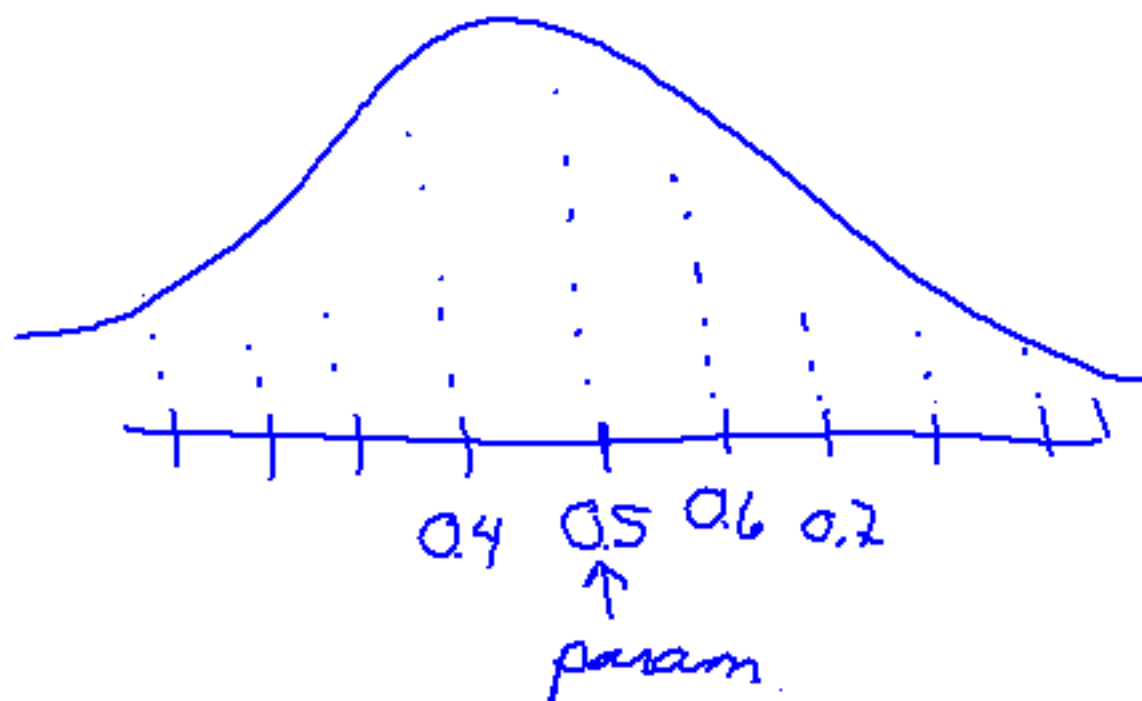
`randInt(1, 1000)`

## Sampling Distr.

- values of a statistic  
in all samples &  
make a picture (histogram)

Ex: coin flip  $\times 10$

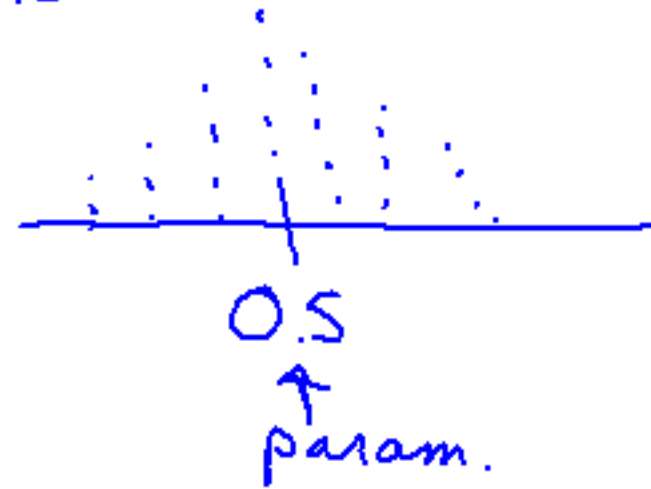
$\approx$  normal  
center - where the param.



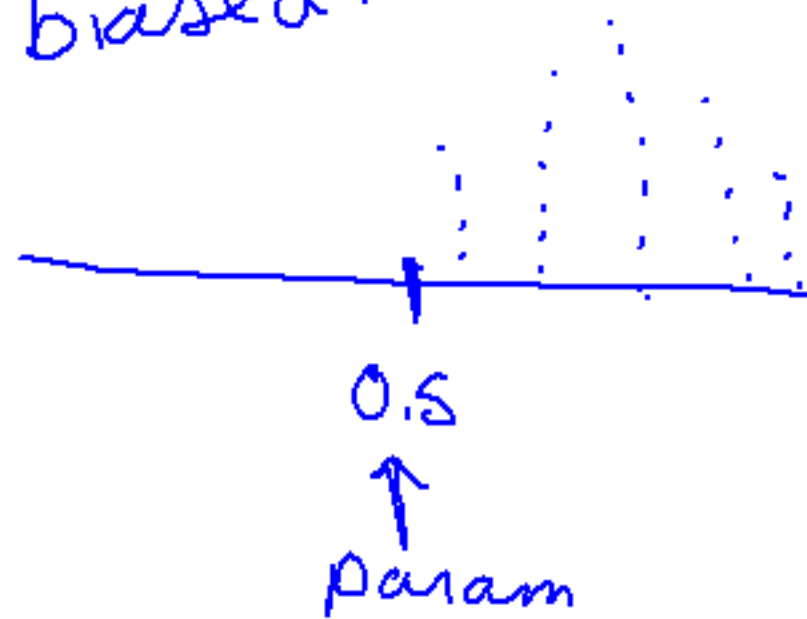
## Unbiased est.

- when the center of sampling distr. = parameter.

Unbiased:



biased:



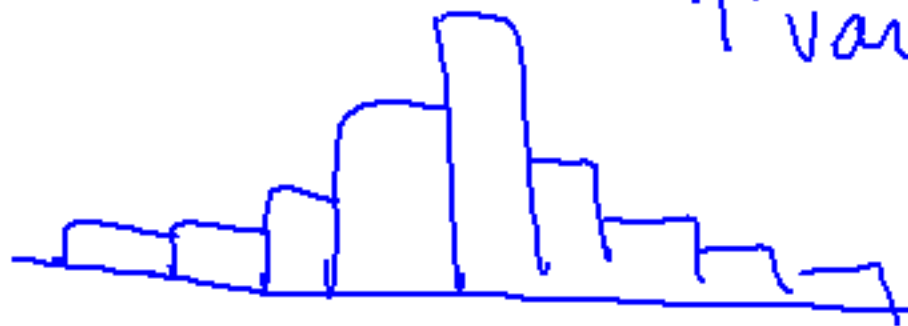
# Variability of Statistic

↓  
change  
differences

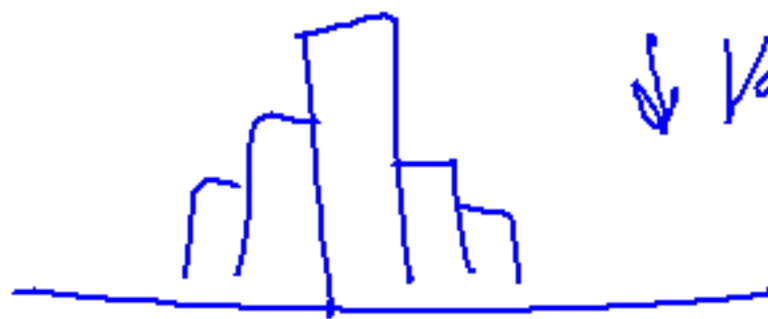
•  $\uparrow n \Rightarrow \downarrow$  variability

• spread of sampling distr.

Ex:



$\uparrow$  variability



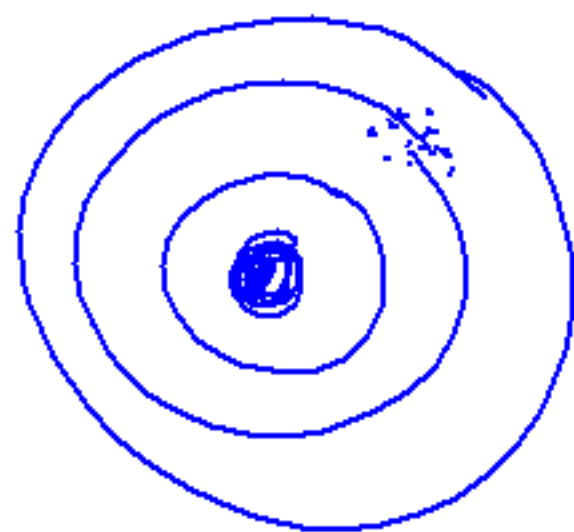
$\downarrow$  Variability

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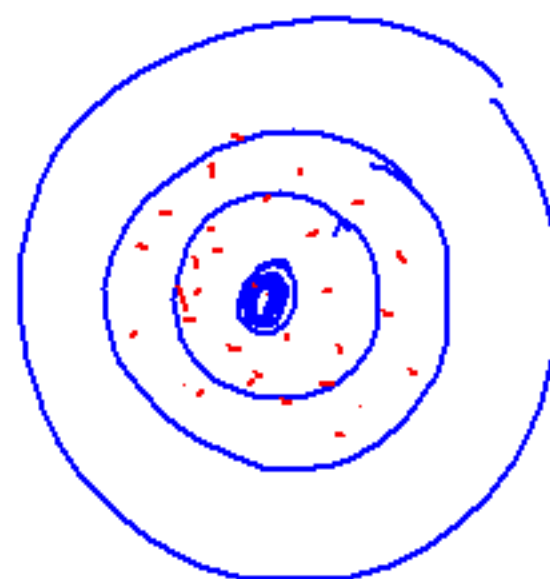
# Bias vs. Variability

↓  
accuracy  
to "center"  
or parameter

↓  
precision



↑ bias  
↓ variability



↓ bias  
↑ variability



p. 278 - histogram.

Why randomize?  
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